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WHAT IS CLAIMED IS:

1. A magnetoresistance effect element comprising:

a first ferromagnetic layer;

an insulating layer overlying said first ferromagnetic layer; and

a second ferromagnetic layer overlying said insulating layer,

said insulating layer having a through hole penetrating its thickness direction at its predetermined position, said first ferromagnetic layer and said second ferromagnetic layer being electrically connected to each other via said through hole, and said through hole having an opening width not larger than 20 nm.

2. A magnetoresistance effect element according to claim 1, wherein an electric resistance between said first ferromagnetic layer and said second ferromagnetic layer changes with a relative arrangement of magnetizations of said first and second ferromagnetic layers.

3. A magnetoresistance effect element according to claim 1, wherein said through hole converges toward said first ferromagnetic layer, and the converged end of said through hole defines the opening width.

4. A magnetoresistance effect element according to claim 1, wherein said insulating layer has a plurality of said through holes.

5. A magnetoresistance effect element according to claim 1, wherein resistance between said first ferromagnetic layer and said second ferromagnetic layer is in a range from 5 Ω to 100 Ω, and a magnetoresistance ratio of the magnetoresistance effect element is not smaller than 20%.

6. A magnetoresistance effect element according to claim 1, wherein said insulating layer is a polymer, or an oxide, nitride or fluoride containing at least one element selected from the group consisting of aluminum (Al), titanium (Ti), tantalum (Ta), cobalt (Co), nickel (Ni), silicon (Si), zirconium (Zr), hafnium (Hf) and iron (Fe), and

said first and second ferromagnetic layers are made of iron (Fe), cobalt (Co), nickel (Ni), or made of an alloy, an oxide, a nitride or a Heusler alloy containing at least one element selected from the group consisting of iron (Fe), cobalt (Co), nickel (Ni), manganese (Mn) and chromium (Cr), or made of a compound semiconductor or an oxide semiconductor including at least one element selected from the group consisting of iron (Fe), cobalt (Co), nickel (Ni), manganese (Mn) and chromium (Cr).

7. A magnetoresistance effect element according to claim 1, wherein an additive element which is different from elements composing said first and second ferromagnetic layers is incorporated at said connected portion between said first and second ferromagnetic layers, and a thickness of said connected portion where said additive element is incorporated is not larger than 10 atomic layers.

8. A magnetoresistance effect element including a plurality of the magnetoresistance effect elements according to claim 1, wherein the magnetoresistance effect elements are formed in one body and electrically connected in series.

9. A magnetic reproducing element comprising a magnetoresistance effect element including:

a first ferromagnetic layer;

an insulating layer overlying said first ferromagnetic layer; and

a second ferromagnetic layer overlying said insulating layer,

said insulating layer having a through hole penetrating its thickness direction at its predetermined position, said first ferromagnetic layer and said second ferromagnetic layer being electrically connected to each other via said through hole, and said through hole having an opening width not larger than 20 nm,

said magnetoresistance effect element being provided on a path of the magnetic flux emitted from a magnetic recording medium so that said first and second ferromagnetic layers are serially aligned on a path of the magnetic flux emitted from a magnetic recording medium, and said magnetoresistance effect element detects a difference between magnetization directions of said first and second ferromagnetic layers as a resistance change .

10. A magnetic reproducing element according to claim 9, wherein one of said first and second ferromagnetic layers located

remoter from said magnetic recording medium is pinned in magnetization in one direction.

11. A magnetic reproducing element comprising a magnetoresistance effect element including:

a first ferromagnetic layer;

an insulating layer overlying said first ferromagnetic layer; and

a second ferromagnetic layer overlying said insulating layer,

said insulating layer having a through hole penetrating its thickness direction at its predetermined position, said first ferromagnetic layer and said second ferromagnetic layer being electrically connected to each other via said through hole, and said through hole having an opening width not larger than 20 nm, and said magnetoresistance effect element being arranged so as to make a main plane of said first ferromagnetic layer being substantially perpendicular to a recording surface of said magnetic recording medium.

12. A magnetoresistance effect element according to claim 11, wherein said through hole is out of a center of symmetry in major plane of said insulating layer toward said magnetic recording medium.

13. A magnetic memory comprising:

magnetoresistance effect element including:

a first ferromagnetic layer being pinned in magnetization in a first direction;

an insulating layer overlying said first ferromagnetic layer;

a second ferromagnetic layer overlying said insulating layer, said second ferromagnetic layer being free in direction of magnetization, and at least one of a reading and a writing being executable by flowing a current in a direction of its layer thickness;

a nonmagnetic intermediate layer overlying said second ferromagnetic layer; and

a third ferromagnetic layer overlying said nonmagnetic intermediate layer and being pinned in magnetization in a second direction substantially opposite from said first direction,

said insulating layer having a through hole penetrating its thickness direction at its predetermined position, said first ferromagnetic layer and said second ferromagnetic layer being electrically connected to each other via said through hole, and said through hole having an opening width not larger than 20 nm.

14. A magnetic memory according to claim 13, further comprising a pair of electrodes which supply said current, said electrodes partly cover a major plane of said first and second ferromagnetic layers, and said through hole being provided between said electrodes.

15. A magnetic memory comprising:

magnetoresistance effect element including:

a first ferromagnetic layer being pinned in magnetization in a first direction;

an insulating layer overlying said first ferromagnetic layer;

a second ferromagnetic layer overlying said insulating layer, said second ferromagnetic layer being free in direction of magnetization, and at least one of a reading and a writing being executable by flowing a current in a direction of its layer thickness;

a nonmagnetic intermediate layer overlying said second ferromagnetic layer; and

a third ferromagnetic layer overlying said nonmagnetic intermediate layer and being pinned in magnetization in said first direction,

said insulating layer having a through hole penetrating its thickness direction at its predetermined position, said first ferromagnetic layer and said second ferromagnetic layer being electrically connected to each other via said through hole, and said through hole having an opening width not larger than 20 nm.

16. A magnetic memory according to claim 15, further comprising a pair of electrodes which supply said current, said electrodes partly cover a major plane of said first and second ferromagnetic layers, and said through hole being provided between said electrodes.

17. A magnetic memory comprising a magnetoresistance effect element including:

a first ferromagnetic layer;

an insulating layer overlying said first ferromagnetic layer; and

a second ferromagnetic layer overlying said insulating layer,

said insulating layer having a through hole penetrating its thickness direction at its predetermined position, said first ferromagnetic layer and said second ferromagnetic layer being electrically connected to each other via said through hole, and said through hole having an opening width not larger than 20 nm,

one of said first and second ferromagnetic layers being pinned in magnetization in a first direction,

another of said first and second ferromagnetic layers being free in direction of magnetization and

at least one of reading and writing being executable by flowing a current in a direction of thicknesses of said first and second ferromagnetic layers.

18. A magnetic memory according to claim 17, further comprising a pair of electrodes which supply said current, said electrodes partly cover a major plane of said first and second ferromagnetic layers, and said through hole being provided between said electrodes.

19. A magnetic memory comprising a plurality of memory cells, said memory cells being two-dimensionally arranged, each of said memory cells being separated each other by insulating region, a current being provided to each of said memory cells by a conductive prove or fixed wiring, an absolute value of a writing current provided to each of said memory cells being larger than an absolute value of a

reading current provided to each of said memory cells, and

each of said memory cells having a magnetoresistance effect element including:

a first ferromagnetic layer;

an insulating layer overlying said first ferromagnetic layer; and

a second ferromagnetic layer overlying said insulating layer,

said insulating layer having a through hole penetrating its thickness direction at its predetermined position, said first ferromagnetic layer and said second ferromagnetic layer being electrically connected to each other via said through hole, and said through hole having an opening width not larger than 20 nm,

one of said first and second ferromagnetic layers being pinned in magnetization in a first direction,

another of said first and second ferromagnetic layers being free in direction of magnetization and

said writing current and said reading current being provided in a direction of thicknesses of said first and second ferromagnetic layers.